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ABSTRACT

This study compares traditional lecture (TL) and personalized system of instruction (PSI) teaching methods for an introductory criminal evidence class at Cerritos College (California) during the 1974-75 academic year. The subjects were 189 lower division students, the vast majority of whom were declared law enforcement majors. Since both sections each semester were day offerings, most students were full-time and not currently employed in law enforcement agencies. Registration counts indicate that significantly more students were attracted to TL than to PSI sections, reflecting students' reluctance to attempt experimental curricula. Although significantly higher percentages of PSI students achieved A and B grades, the withdrawal rate was significantly higher in the PSI sections, and may correspond to the lower grades earned in the TL sections. PSI students were, however, able to complete course requirements sooner than TL students. Because the course has open enrollment and lacks the proper randomization. this study's internal validity is suspect. Even with proper control groups, the PSI group's performance relative to the TL group's must be questioned because PSI offers the advantage of clear goals and objectives in the study guide. A review of the literature is included, and the author recommends further study and implementation of PSI. (HJK)

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EVALUATIVE COMPARISON OF PROGRAMMED SYSTEM OF INSTRUCTION AND TRADITIONAL LECTURE APPROACHES IN A BASIC ADMINISTRATION OF JUSTICE CLASS AT CERRITOS COLLEGE

BY

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CERRITOS COLLEGE

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Introduction

Context of the Problem

Toffler's oft quoted maxim that we must "learn how to learn" has now assumed special urgency. McLean (1970) intoned this when he wrote, "The type of philosophic base that best fits the modern concept of democratic society in a highly scientific and technological age is that of individualization of the educational process (p. 6)."

Society itself pressures schools to encourage individualism. Wilson (1973) has contended that group education just can't meet the diverse needs in educational goals and objectives. Because marketable skills have become imperative necessities, societal needs have forced the student to direct his learning to develop these skills (O'Neal, 1973).

The mating of Bloom's "degree of learning" thesis with learning in a self-paced, programmed way seemed propitiously resolved to Franklin (1974). Now, more than ever before, the vast majority of students should be able to master a subject's content.

Roueche (1975) assumed pedagogical group learning was untenable, as Wilson had, but further implied that there now are no teaching methods or styles best suited for all students. The alternative, Roueche related, was that:

> The student should take charge of his learning; he should study at a rate, place, and time most convenient and effective for him. The student should progress only as rapidly as his ability permits. Most students can attain mastery, some just move faster than others (pp. 19-20).

Statement of the Problem

Of all innovative instructional approaches currently in vogue, self-paced education presents the most distinctive pedagogical and philosophical contrast with the traditional lecture (TL) method.

Self-paced, individualized, and programmed instruction are widely used descriptions for student directed instruction which this study will refer to as Programmed System of Instruction (PSI).

The general goal of this study was to compare and contrast TL and PSI methods of instruction for the Introductory Criminal Evidence class (AJ 4) at Cerritos College in order to determine the feasibility of implementing a similar PSI approach in other departmental offerings where only TL instruction is used.

Specific purposes of this study were to: (1) compare achievement for PSI and TL AJ 4 students when both sections were taught by the same instructor at approximately the same time, (2) determine if students could spend less time studying in PSI AJ 4 and still achieve "successful performance rates" (A through C), (3) examine if retention was adversely affected when the PSI approach was used in AJ 4, (4) ascertain if unstructured peer tutoring practiced in PSI AJ 4 was more successful than institutionalized campus tutoring occasionally tried in TL AJ 4, and (5) contrast registration trends for both sections during 1974-75 to determine initial student appeal.

Definition of Terms

PSI AJ 4. Personalized System of Instruction method format stressing step mastery, unit module completion, tutorial student aides, textual materials and workbook, and self-pacing.

TL AJ 4. A traditional lecture-discussion class emphasizing course content comparable to PSI AJ 4, and with similar evaluative measurements, but without PSI methodological format. Comparable goals and objectives exist for both approaches.

Cerritos "Head" Counts. At the close of registration during the second week of classes, an accounting of all students who have ever attended a class must be submitted to the division office.

ADA Census Counts. During the fourth and twelfth weeks each semester, the instructors must indicate the number of students "actively" enrolled for each section. Dollar matching state revenues based upon "Average Daily Attendance" counts determine the operating revenue of the college.

Prime Time Scheduling. Instructional hours most favored by students and faculty, i.e.: MWF 8-12 noon, TuTh 8-11 a.m.

Released Time Units. Usually a grant of three units (eight hours/week) of teaching released time, equivalent to one lecture class in a five class load, which is offered to permit the instructor to prepare new instructional formats for existing courses.

PSI AJ 4 Workbook. A modulized workbook to accompany the PSI textual-discussion approach, written in small units with measureable performance objectives, applicable examples, and self graded quizzes. It was compiled on a released time grant.

Peer Tutoring. Originally envisioned to encourage rapidly advancing PSI AJ 4 students to tutor fellow students both during the modules and when the tutor had completed all of the modules and met the course requirements.

Background for the Problem

After having completed a campus in-service class on PSI methods, the chairman of Cerritos' Administration of Justice (AJ) Department requested and was granted three units released time during the Fall Semester, 1973, to investigate the possibility of implementing a PSI approach in his AJ 4 class. Although this professor (Ed.D., U.C.L.A.) had earlier been intrigued with the possibility of computer programming in this course, difficulties in assuring student access to the computer terminals forced him to adopt the workbook approach instead.

Using the same text in both of his day sections of AJ 4, the proposed PSI class was conceived as the treatment group, the TL class as the control

group. Since course goals and student performance (behavioral) objectives remained constant for both the proposed PSI and existing TL sections, unit instructions, case studies, self graded quizzes and textual references had to be written for the new PSI venture because lecture presentation was not intended.

By April, 1974, enough progress had been made on the PSI workbook to permit a demonstration-explanation for the Dean of Academic Affairs and the Chairman of the Social Science Division. Concurring in the excellence of the workbook approach, the AJ professor was encouraged to administer experimental pretests from the workbook to one of his existing TL AJ 4 sections. This experimental TL AJ 4 section took the quizzes and read from the self-paced study guide while the PSI workbook was being completed. Not only did this group uncover unforeseen interpretive difficulties regarding both the workbook's verbal style and arrangement of student performance objectives, but they positively re-enforced the efficacy of the student behavioral objectives which had been selected.

The workbook was completed by early summer, and used in first draft form initially in the treatment PSI section during the Fall Semester, 1974. Minor corrections were made during this semester, and pretest-posttest comparisons with the TL section were conducted.

Significance of the Problem

The primary institutional significance of this comparative research study was to determine if other classes in the core package of AJ (1-5) could benefit from a PSI alternate instructional approach. Quite realistically, student appeal and class retention were as important in determining the college's commitment to PSI as the grades the students earned in the PSI section.

Other departments on-campus, such as Chemistry, have tried versions of the self-paced PSI approach for longer periods of time. Institutional Research follow-up studies have been done for some of these self-paced offerings, and such comparative findings re-enforced the viability of AJ 4's PSI approach, while emphasizing the precautions needed before experimenting further with PSI in AJ.

Literature Review

Although literature review searches from ERIC files and from the records of the LANCERS office of the Los Angeles County Superintendent of Schools for the last five years relative to programmed instruction have resulted in a multitude of tangentially related sources, information contained in these selections did provide insight into the goals and objectives of programmed education relative to this study.

Among the multitude of sources, two distinct chronological trends emerged. From 1968 through 1972 emphasis was upon defining, promoting and hypothesizing upon the potential instructional effectiveness of individualized instruction. The plethora of recent studies have stressed specific courses and their needs, or techniques of application in multi-media approaches, not general evaluations of this method of instruction.

Among the many varieties of programmed instruction is Personalized System of Instruction (PSI) pioneered by psychologists Fred S. Keller and his graduate assistant J. Gilmore Sherman. This concept first germinated in Keller's mind during the 1920's after talks with B.F. Skinner while both were students at Harvard. Having the opportunity during World War II to implement his plan, Keller created a training system for the services which provided immediate re-enforcement with the subject content divided into small modules and the learner studying at his own pace. While at Columbia University in the

early 1950's, Keller and Sherman instituted the PSI method in psychology for the first time. Material presented in small amounts with measureable terminal behavior gave immediate feedback while punishment for not learning was kept to a minimum. By 1967, Keller, Sherman, Ruskin and others had introduced the PSI approach nationally, with workshops instituted during the next five years (Ruskin, 1974).

Ruskin (1974), associate editor of the PSI Newsletter at Georgetown University, has written a comprehensive synopsis of the movement's history, objectives, published literature, and prospects. Indicative of all programmed approaches, the greatest bulk of PSI research has been done since 1970. Among the more typical studies have been efforts to compare PSI and TL instructional methods. Although Ruskin cited many such studies, some of which will be analyzed in the discussion section, the lack of random selection has made such comparisons difficult. The obvious changes that occur from one semester to the next have made scientific appraisal of PSI ventures difficult at best, Ruskin implied. More studies in nonbehavioral science disciplines would provide a broader academic base to better evaluate the findings of such PSI-TL comparative studies (Ruskin, 1974).

The five major tenets of PSI stress: (1) module steps, (2) the use of the written word and traditional texts supplemented with special study guides, (3) unit achievement before advancement to the next assignment, (4) the concept of self-pacing, and (5) the use of students as peer tutors.

The three steps in self-pacing formulated by Heathers (1971) to encourage students to effectively learn without constant guidance were: (1) a programmed workbook, (2) student peer tutoring, and (3) student use of his competencies in planning and conducting his learning activities. Learning tasks must be on a par with student prerequisite abilities, appropriate learning conditions must be provided, new instructional methods must be tried, and

students must be allowed sufficient time to learn their tasks, Heathers stated. Heathers concluded with a five point instructional model for all individualizing. He emphasized: (1) selecting only measureable learning tasks, (2) pretesting for student mastery, (3) diagnosing student learning patterns, (4) working out lesson plans, and (5) providing individual help, as needed.

A comprehensive questionaire was sent by Svara (1972) to seventy three colleges to ascertain what conditions must exist for individualized instruction to occur. With thirty colleges responding, the ten primary criteria which emerged as necessary to effect individualized instruction were the: (1) statement of objectives, (2) time allocated for study, (3) availability of assessment by students, (4) reenforcement of student measurement, (5) mode of learning, (6) schedule of classes, (7) location of these classes, (8) rate of student achievement, (9) testing format, and (10) division of the subject matter modules. Svara estimated that one to one and a half years preparation time was necessary to ready a three unit audio-visual individualized package. Svara also stressed peer tutoring, stating of objectives according to Mager and Bloom, duplicating student handouts, using ample audio-visual aides, treating lectures as assigned material, and above all, setting minimal expectations as to the pace of completion.

Aspects of Keller's five point PSI method were re-iterated by Heathers and Svara, with amplification on needed instructor preparations.

The dialog concerning the comparative merits of traditional and programmed instruction has continued unabated since the early 1970's. Anderson and Ikenberry (1973) gave one of the more complete renditions of the drawbacks associated with traditional education. Restrictions of classes fitting into prescribed times, the absence of objectives, failure to provide rapid student feedback, the inability to adapt to student differences, the propensity for non-sequential learning, and an ivory tower approach with no dis-

cernable methodology were among the limitations stressed.

Critics of individualized, programmed instruction abound. G.O.M. Leith as far back as 1969 expressed second thoughts over the assumption that programmed instruction provided the answer for all motivational learning problems.

Even more adamantly, Holland and Hoffman (1971) inferred that conclusive data in applied task courses lent scant support for the emphasis given to individualization. Jan-Tausch (1971) was also wary of the programmed approach when offered as the only alternative. Programmed instruction only works for certain students and teachers, tends to make the teacher only a rote prescriber, and denies other non-education variables which may affect student learning, Jan-Tausch cautioned. Common to most criticisms was the assertion that effective learning is as much a by-product of effective teaching as of student directed learning. As Jan-Tausch half jestingly, half seriously implied in summarizing programmed literature, "One might almost infer that teachers can be slow learners in the area of individualization of instruction (p. 6)!"

In part due to Glaser's (1968) early promptings that we must change educational attitudes and environments to better encourage programmed instruction, individual, self-paced instruction has become a multifaceted endeavor. So much so that O'Day (1970) and Pocztar (1972) deemed it necessary to write brief compendiums cataloging innovations in programmed methodology.

Although strengths and weaknesses in programmed instruction have been described, summation might help. Among the anticipated gains in using individualized instruction, the following benefits might be expected. The teacher would have to know the discipline in its broadest context, and cease being simply a clerk, disciplinarian, or imparter of information (Wilson, 1973). Although not a panacea for all educational problems, programmed instruction does force an instructor to more fully define goals and objectives (Treffinger,

1973). Time is the delimiting factor in most students' unsuccessful mastery of a subject, and self-paced approaches do permit students to work independently (Hunt and Mathis, 1964; McCombs, 1974). Learning aides and instructional packets utilize the most modern of educational technology (Elkins, 1970). The implementation of a PSI method does alter an instructor's behavior and attitude, but both Siegel (1974) and McLean (1970) emphasized that teaching a programmed instruction section can be the best experience. Learning is by doing, theory must eventually be enacted into practice.

By late 1973, individualized instructional evaluations were de-emphasizing the mechanical programming aspect and stressing the application of this instructional tool to a given curriculum. Anderson and Ikenberry (1973) emphasized the issues and implications when college curriculums are changed to meet instructional techniques inherent in programmed education.

Kelley (1973) stressed the need to ascertain the school's educational climate before implementing individually guided programs, while O'Neal (1973) was among the earliest to effectively analyze what it meant to let the learner control the instructional program. Dale (1972) again reaffirmed the need to build an acceptable learning environment and stated the necessity of constantly reappraising its goals and objectives.

Both Harper (1973) and Treffinger (1973) analyzed the methods for selecting students best equipped to profit from individualized instruction.

By the mid-Seventies, media instruction had become so commonplace that some reconciliation with the more traditional instructional methods employed in early programmed approaches was needed, which McCombs (1974) attempted to do.

Finally, 1974-75 would appear to be the year to evaluate student achievement relative to programmed instruction, and both instructor and student attitudes toward self-paced education. Franklin (1974) stressed

efficiency in learning with programmed approaches, McMeen (1974) retention comparisons with TL classes, and Siegel (1974) instructor performance factors based on self interests and biases.

Evaluating the results of comparative research in PSI and TL methods proved to be a study in conflicting orientations.

The efficacy of a lectureless, programmed approach was questioned by Halvorson (1969), McConnell and Lamphear (1969), Oen and Sweany (1971) and Couch (1973). No significant differences were observed between programmed and traditional approaches in the disciplines investigated.

Of those who examined specific PSI educational endeavors (some to be analyzed in the discussion section) Keller (1968, 1969), Moore, Mahan and Ritts (1969) and Corey and McMichael (1970) found significantly higher grades in PSI sections; Sheppard and MacDermot (1970), and Born, Geldhill and Davis (1972) discovered higher comprehension and retention skills in PSI sections; while Keller (1968), Born (1971), Born, Gledhill and Davis (1972) and Sheppard and MacDermot (1970) discussed the reasons for higher education withdrawal rates in PSI classes.

Even after such evaluations have been completed, we are often left with the distinct possibility that non-instructional variables are responsible for the success of programmed educational endeavors. Costs are higher in programmed classes, and Harper (1973) recommended using these approaches only in beginning or advanced courses; while Siegel (1974) questioned whether the time, money and inconvenience needed to retrain the staff was worth the effort. Abramson and Kagan (1973) found that while passive females are the most receptive to educational tasks, they often needed the most pretraining if programmed instruction was to succeed in technical disciplines. Dogmatic students of both sexes tend to experience the most difficulties in adjusting to programmed learning (Grippen and Ohnmacht, 1974). The inability of students

to comprehend what programmed instruction means accounted for considerable early withdrawal, or failure to register (Jiola, 1972).

Hypotheses

From literature review findings, it is hypothesized that: (1) the "successful performance rate" will be higher in PSI AJ 4 than in TL AJ 4, (2) a majority of students will finish the PSI AJ 4 course sooner than students taking TL AJ 4, (3) students will prefer TL AJ 4 to PSI AJ 4 as evidenced in registration trends, and (4) the "retention rate" will be higher in TL AJ 4 than in PSI AJ 4.

Rationale for the Hypotheses

The "successful performance rate," defined as an earned A through C grade, has traditionally been higher in self-paced PSI sections than in TL ones at Cerritos College. It is hypothesized that students in AJ 4 will conform to this pattern (Schaumburg, 1973).

The primary goal in any self-paced class is to encourage students to work at their own pace, and to challenge exams and exercises only when they feel they are ready. In so far as over half the PSI chemistry students tended to finish their assignments before the end of the semester, it is hypothesized that a majority of PSI AJ 4 students will matriculate before the end of the semester wher TL students do (Schaumburg, 1973).

Patterns in experimental, joint lecture, and self-paced programming at Cerritos College have indicated a basic reticence on the part of the students to voluntarily sign up for such innovative classes. It is expected PSI AJ 4 will substantiate this trend (Hinrichsen and Schaumburg, 1975).

The "retention rate," defined as the proportion of those students finishing a class relative to the initial "head count" enrollment, has been customarily lower in self-paced sections on campus. It is anticipated that registration records will verify this trend for the PSI AJ 4 sections.

The following assumptions and limitations for the hypotheses were made.

According to numerous literature review articles dealing with experimental programming, students with higher tolerance levels for abstractions and a need for self directed study have preferred experimental over traditional classes. Conversely, students favoring a more structured approach in which the instructor provides both the guidance and reassurance have preferred TL sections. Based on enrollment patterns evident in PSI sections, AJ or others, it was assumed that students did select the type of instructional section based on the above criteria (Tuckman, 1972; Pascal, 1971).

Because preference for or tolerance of abstraction was not statistically measured, two proposed hypotheses could not be tested.

Variables

In each of the four hypotheses, the respective methods of instruction (PSI and TL) constituted separate independent variables, usually subcategorized as moderator variables.

The control variable in this study was the subject content differences necessitated by the different instructional approaches. Although both sections (TL and PSI) used the same text, and made use of the same flyers and handout materials, only the PSI class employed the specially designed workbook which contained the self test items. This workbook became, in a very real sense, the major treatment difference in the comparison because presented material and exam coverage were comparable for both approaches.

The intervening variable, and the most difficult to measure, was the attitude each student brought into the respective AJ 4 section.

Dependent variables, or those which have measureable performance outcomes, were "successful performance rates" for both approaches, the length of time necessary to complete the course requirements in both instances,

enrollment preferences during registration, and the respective "retention rates."

Method

Subjects

The subjects of this comparative AJ 4 study for the academic year 1974-1975 were 189 lower division undergraduate students at Cerritos College.

The vast majority of these student subjects were declared law enforcement majors, and mostly full-time students who were not currently employed in law enforcement agencies since both sections each semester were day offerings.

Second or third semester standing (high freshman or low sophomore) constituted the typical student academic placement.

During the Fall Semester, 1974, 54 students initially attended TL AJ 4, 44 PSI AJ 4. For the Spring Semester, identical numbers enrolled in TL AJ 4, with 37 registered in PSI AJ 4.

Treatment of the Variables

Independent variables in this study were determined using the following source imputs. The four moderator variable categories for PSI and TL instruction were calculated from the instructor's roll book, division registration records, and the records of Student Personnel Services.

To determine the effects which the control variable (the workbook in PSI AJ 4) had, lesson plans were analyzed for both classes. Since the age variable (18-21) and sex variable (predominantly male) were comparable for both approaches, it was not felt necessary to further qualify these control variables.

Student attitudes were measured in an initial pretest survey given to both sections.

The four dependent output variables were compared using similar procedures. "Successful performance rates," "retention rates," and length of time comparison were calculated using the instructor's roll book. Registration trends were gathered from division records, with pretest measurements administered in the classrooms.

Procedure

In order to insure external validity and minimize history and selection bias, the following factoral design was employed:

PSI AJ 4: O_1 X O_2

TL AJ 4: O_3 O_4

During 1974-75 there were non-equivalent control groups.

Pretest exercises (O_1, O_3) determined initial student academic placement and indicated tolerance levels for abstraction and aptitude for self directed study.

Only the PSI sections received the treatment (the workbook).

The same posttest (O_2, O_4) was administered to both sections upon completion of the course requirements.

Six procedural investigations were conducted.

Registration class-counts for the Fall Semester, 1974 and Spring Semester, 1975, were compared for PSI and TL AJ 4.

The professor's grade book was used to determine the "successful performance rate" (A through C) in both PSI and TL AJ 4. The record book also indicated all who received grade credit in either section in contrast to those initially registered during census headcount week, and this difference constituted the "retention rate" for both AJ 4 sections.

Interviews with the instructor determined the average rate of completion as a length of time analysis for PSI and TL AJ 4 students.

Records kept by the professor indicated the numbers of PSI AJ 4 students who volunteered for informal peer tutoring in PSI AJ 4 contrasted with institutionalized tutoring used in TL AJ 4.

Investigation of abstracts and reports from the Office of Institutional Research provided comparative studies of other departmental efforts in self-paced PSI education on campus.

A literature review search was conducted in ERIC, Psychology Abstracts, and other related journal sources to determine directions and evaluations of other self-paced programs.

Data Analyses

Descriptive Statistics

The comparative longitudinal analysis of student registration counts throughout the registration period was presented both in tabular and graphic form.

The proportions of "retention rates" and "successful performance rates" for the PSI and TL approaches was presented both in tabular and graphic form in order to summarize the results and thus facilitate comparisons between the two approaches.

Inferential Statistics

In order to assess the statistical significance between any observed differences in student registration counts, the registration period was divided into nine segments. For each segment the number of PSI and TL students enrolled was divided by the appropriate collective maximum class size figure, thus giving the proportion, relative to maximum PSI or TL enrollment, of students already enrolled. These proportions were then arranged in table format (two groups - PSI and TL and nine proportions - days 1-9).

In comparing registration enrollment percentages in PSI and TL sections for the academic year 1974-75, a tabular Chi Square test of observed and

expected frequencies for each day of registration was undertaken as long as both sections had open enrollment. The .05 level of confidence was employed for each test (See Table 1).

In order to assess the statistical significance between any observed differences in proportions between PSI and TL approaches concerning "retention rates" and "successful performance rates," comparative proportions based on the Chi Square distribution were used.

"Successful performance" (A-C) and "unsuccessful performance" (E and W) percentages were compared by means of a 2 X 2 Chi Square calculation since only successful grades were earned in both sections. For purposes of this study, Incompletes (E) are treated as unofficial withdrawals and combined with the official withdrawals (W) to form the "unsuccessful performance" percentages. The .05 level of confidence for a two tailed Chi Square test was employed (See Table 2).

A Chi Square tabular calculation of observed frequencies (O) and expected frequencies (E) was undertaken in comparing the respective final grade percentages recorded in each instructional approach ($X^2 = \frac{(O-E)^2}{E}$). Again, the .05 level of confidence for a two tailed Chi Square test was used (See Table 3).

A 2 X 5 ten cell computer assisted Chi Square comparison at the .05 level of confidence for all grades given in both PSI and TL AJ 4 was calculated (See Table 3).

Results

With similar maximum enrollments, the tabular Chi Square test of expected and observed frequencies for the first four days of registration indicated significantly more students were attracted to TL than PSI as long as both sections were open ($p. < .05$). The incidence of significance at the .05 level

of confidence declined on the tabular test of frequencies beginning with day 5 ($p. > .05$) when only the PSI day section was open for enrollment (See Table 1).

TABLE 1

PROPORTION OF STUDENTS REGISTERED RELATIVE TO MAXIMUM PSI AND TL CLASS ENROLLMENT FOR DAY 1 THROUGH 9.

	Days								
	1	2	3	4	5	6	7	8	9
TL AJ 4	59% (23.5)	96.5% (38.5)	100% (40)	100% (40)	100% (40)	100% (40)	100% (40)	100% (40)	100% (40)
PSI AJ 4	20% (8)	34% (13)	44% (17.5)	53% (21)	68% (27)	70% (28)	80.5% (32)	95% (38)	100% (40)
Difference	39%*	62.5%*	56%*	47%*	32%	30%	19.5%	5%	0%

* Significant beyond .05 level of confidence.

( ) Average number.

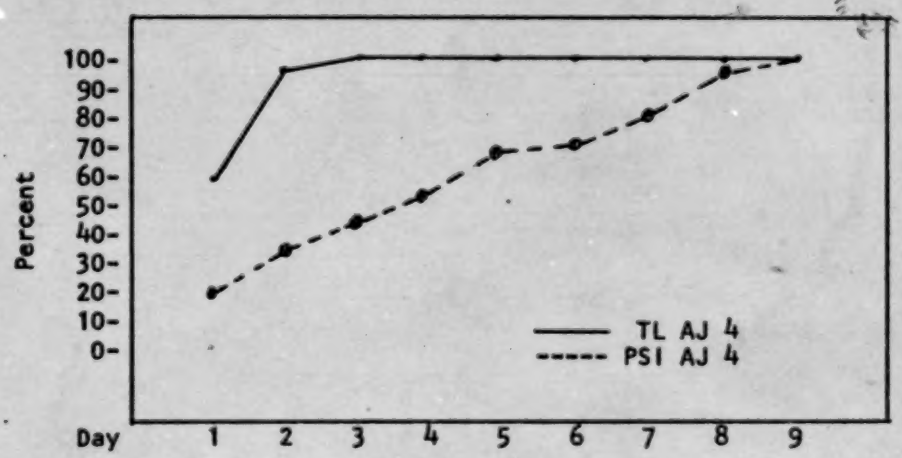

Figure 1. Longitudinal comparison of student registration counts between PSI and TL classes as a function of the percentage of students registered relative to maximum class size for days 1 through 9.

The Chi Square comparison of "successful performance" and "unsuccessful performance" percentage resulted in a X^2 of 5.02, or significant beyond the .05 level of confidence ($p. < .05$) for df 1 (See Table 2).

TABLE 2

COMPARISON OF SUCCESSFUL (A-C) AND UNSUCCESSFUL PERFORMANCE (E AND W) BETWEEN PSI AND TL AJ 4 STUDENTS AS A COMPARISON OF ACADEMIC ACHIEVEMENT.

	SUCCESSFUL	UNSUCCESSFUL
TL AJ 4	77.8% (84)	22.2% (24)
PSI AJ 4	61.7% (50)	38.3% (31)
DIFFERENCE	16.1%*	16.1%*

* Significant beyond the .05 level of confidence.

The comparison of expected and observed frequencies for successful grades (A-C) indicated no significance at the .05 level ($p. > .05$) within the TL AJ 4 approach when compared to the total number of grades (A-C) given; but did result in significant findings ($p. < .05$) for grades A and C in the PSI approach when compared to the expected frequencies of successful grades given. The Chi Square findings with a df 1 resulted in significance at the .001 level of confidence for grades A and C (See Table 2) (Refer to Table 3).

TABLE 3

COMPARISON OF FINAL GRADES BETWEEN PSI AND TL AJ 4 STUDENTS AS A FUNCTION OF CATEGORIES OF ACADEMIC ACHIEVEMENT.

	A	B	C	W	E	T.
TL AJ 4	22.2% (24)	25.0% (27)	30.6% (33)	14.8% (16)	7.4% (8)	108
PSI AJ 4	42.0% (34)	17.3% (14)	2.5% (2)	37.0% (30)	1.2% (1)	81
DIFFERENCE	19.8%*	7.7%	28.1%*	22.2%*	6.2%	

* Significant beyond the .05 level of confidence.

The "withdrawal rate" comparisons were also significant beyond the .05 level of confidence ($p. < .05$) for both TL and PSI AJ 4, the TL sections having a "withdrawal rate" considerably lower than the expected frequency, the PSI sections significantly higher than the expected frequency (See Table 3).

The ten cell Chi Square test for all grades given in both sections indicated a X^2 of 39.97, significant ($p. < .05$) well beyond the .05 level with a df 4 for a two tailed test.

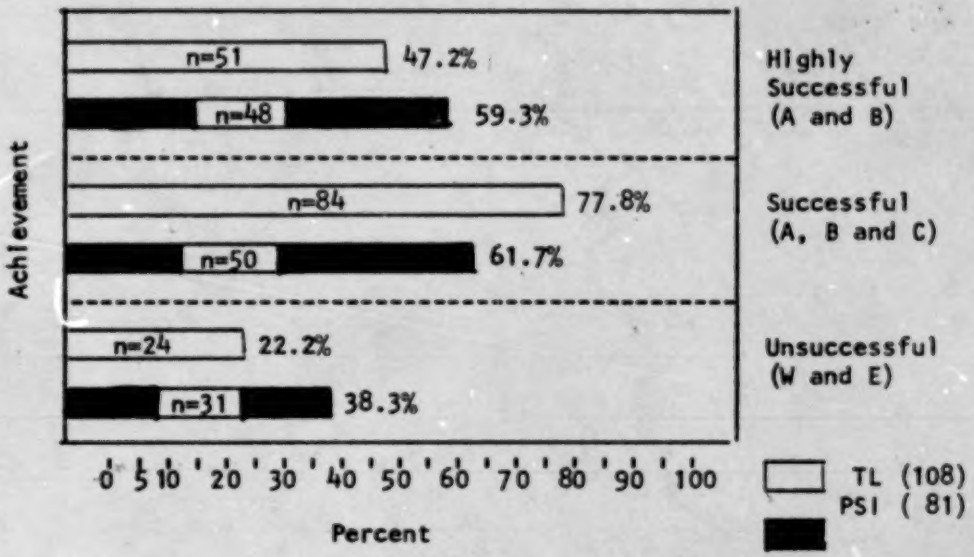

Figure 2. Number and proportion of PSI and TL AJ 4 students who attained "highly successful," or "successful" achievement; or who withdrew or received an incomplete grade based on the original headcount for those officially enrolled.

Discussion

Often an educator must re-invent the wheel in institutional research. After having read Ruskin's (1974) superbly written article on PSI's history, methodology, and literature commentary, it became clear that while his sources re-enforced this study's findings concerning PSI AJ 4's grade and

withdrawal characteristics, his conclusions also confirmed observed difficulties in statistically comparing PSI and TL approaches. This study does duplicate methods and results cited in many sources, and does add to the mass of PSI literature, but it also does meet one of Ruskin's major recommendations. Apparently this undertaking is one of the few published research studies which has compared PSI and TL instructional methods using an APA format for a non-behavioral science discipline.

Every researcher must be cognizant of non-controlled variables which often limit the significance of his findings. Siegel (1974) cautioned against attributing undue significance to statistical results for the experimental group because such differences with TL classes may not be due to the instructional treatment. Lacking proper randomization because AJ 4 is an open enrollment course, this study's internal validity must be suspect. This does not preclude significant external validity, however, because almost all PSI-TL studies emerge from comparable classroom situations where there are similar non-equivalent control groups.

Even with equivalent control groups properly randomized, the treatment group's (PSI section) performance relative to the TL section must be questioned. With the tendency to encourage instructional innovation today, and stress goals and objectives to meet this need, we must remember that the PSI group has an advantage in having such goals and objectives succinctly written out in the study guide (treatment). There is a certain built-in bias favoring PSI whenever goals and objectives are emphasized (Treffinger, 1973).

Enrollment trends in PSI AJ 4 bore marked similarities to previous Cerritos College research findings for both PSI and experimental classes (Schaumburg, 1973; Hinrichsen and Schaumburg, 1975). These results largely reflected Cerritos students' reticence to attempt experimental and innovative curricula. Student preferences should not be discounted either. As Pascal

(1971) found in his study, students who selected independent or directed studies classes indicated significantly greater need for autonomy, flexibility and acceptance of ambiguity, as well as preference for abstract thought. Abramson and Kagan (1973), in addition to their findings on sex preferences regarding PSI education, also stressed that class response modes interacted directly with the students' prior familiarity with the subject content. Such was apparently the case during the Fall semester, 1974 when six students requested section switches compared with none for the Spring semester 1975. Spring semester student enrollees generally evince greater familiarity with curriculum patterns. Interestingly, Jioia (1972) discovered that while programmed students preferred the opportunity of working at their own pace, they missed having class identity and discussion.

Svara's (1972) comprehensive survey stressed the need to set minimal completion standards for PSI ventures. This proved to be the first major problem for Dr. Specht during the Fall, 1974. Students were hesitant to challenge the exams even when prepared. Whether a PSI instructor should assume 30% more students in his classes, as Svara proposed, is an institutional concern.

The inverted grade distribution from the TL normative curve which characterizes PSI grade patterns was admirably duplicated in PSI AJ 4 (Keller, 1968; Ruskin, 1974). The preponderance of A's and B's represented mastery, while the equally high percentages of W's in PSI AJ 4 corresponded to the normal unsuccessful or "lower successful" (C and D) grades given in the TL sections. In PSI classes, students drop-out rather than stay if they feel they are not going to attain mastery (Keller, 1968). Enough research has been done to date to show that PSI classes at least equal and in most cases exceed TL ones in the percentage of "highly successful" grades given, usually by 10 to 15% (Keller, 1968, 1969; Moore, Mahan and Ritts, 1969; Corey and McMichael, 1970).

Can PSI classes emphasize creative conceptualizing? PSI researchers generally have felt so, and generally claim that the shorter module quizzes given in PSI sections actually enhance PSI students' chances on comprehensive finals (Sheppard and MacDermot, 1970; Born, Gledhill and Davis, 1972). Cerritos findings for PSI courses bear this out (Schaumburg, 1973).

Although higher withdrawal rates were anticipated by all researchers in PSI-TL comparisons, only a few have questioned the significance of this comparison (Sheppard and MacDermot, 1970; Born, Gledhill and Davis, 1972). If most marginal students drop PSI classes, in contrast to TL ones, is there any significance in cross comparing both sections?

Use of the same instructor in both sections is also a common procedural approach, although the instructor's biases in favor of PSI or TL methods must be carefully weighed. Such is the case of this study. If different instructors are employed, two biases and at least two instructional techniques must also be controlled.

Peer tutoring is essential to PSI education (Keller, 1968; Ruskin, 1974). The PSI AJ 4 classes at Cerritos have had mixed success in this regard. During the Fall, 1974, students finishing their modules early, and most did, were encouraged to tutor fellow students. Unable to gain units or compensation for this task, many dropped their tutorial responsibilities at the first opportunity. During the Spring, 1975, the instructor himself undertook this tutorial responsibility. Records for institutional tutoring for TL AJ 4 are sketchy. A limited number of TL students did seek outside help, perhaps from PSI students who signed up to provide this service. If there is to be any gain in completing a PSI class early, other than because of employment incentives, other PSI sections must be available (McCombs, 1974).

Conclusions

Emphasizing Jan-Tausch's (1971) thesis, programmed instruction doesn't work for all instructors just as it admittedly doesn't for all students.

Although PSI classes emphasize more textual than audio-visual software, finances are still a major consideration. If fewer students sign up for PSI classes, state funded ADA revenues naturally decline.

Significantly higher withdrawal rates in PSI sections will likely cost the college additional ADA monies now that California mandates dual census accounting (12th as well as the 4th week).

Nevertheless, significantly higher performance among PSI students and the emphasis upon goals and objectives in measureable student performance terms make PSI endeavors doubly attractive.

Cerritos College is encouraged to experiment further with PSI scheduling in disciplines where it is now tried, and begin it in others. Counselors are encouraged to recommend PSI taught classes to all students who might profit thereby, either because of preference or psychological make-up. Until PSI ventures devolve into "highly motivated mediocrity" (Wilson, 1973), the campus should encourage instructors to innovate along these lines. At present, the college can absorb any lessened revenues caused by cuts in ADA, and can fund program development released time requests by potential PSI instructors. There will always be risks, but as long as there is choice in instructional methodology for student and faculty alike, PSI education seems the most viable alternative to TL instruction.

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